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ABSTRACT

The purpose of this research was to conduct a preliminary analysis of a new instrument, the Classroom Environment Index (CEI), designed to measure the psychological environment (press) of the classroom. The structure was essentially the same as other Syracuse indexes, containing 30 scales of 10 items each. Three forms of the instrument were developed. The third revision exhibited adequate reliability and homogeneity, and differentiated between classrooms, subjects, grades, and educational levels. Six first-order and two second-order factors were extracted. Eventually, the CEI will be used to examine relationships between classroom press and student achievement. (Author)

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THE MEASUREMENT OF CLASSROOM ENVIRONMENTAL PRESS

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THE MEASUREMENT OF CLASSROOM ENVIRONMENTAL PRESS[1,2]

The purpose of this research was to analyze and refine a new instrument, the Classroom Environment Index (CEI), designed to measure the psychological environment of the classroom. In a previous study, Walker (1964) used a number of instruments to examine creativity in differing high school climates. One of the instruments used was a measure of the psychological environment of the high school, called the High School Characteristics Index (Stern, 1960a & b). The study described differences in the environment of creative schools as compared with more traditional schools. An interesting by-product of the study was the observation that even in schools judged not to be the type that fostered the development of creativity, there were a number of highly creative teachers.

In studying creativity in school settings, the need became apparent for a measurement of the characteristics of specific classrooms. A problem in studying creativity in secondary education is the extremely small number of high schools that have distinctive characteristics usually associated with creativity. The typical American high school as a total institution does not have creativity characteristics. Factor analyses of the High School Characteristics Index indicate clearly that there are some exceptional high schools akin to the more outstanding colleges, but these are rare (Stern, 1970). Yet within the typical school, individual classrooms seem likely to vary greatly with regard to creative teaching and creative learning. Thus it would seem that a measure of individual classroom environmental characteristics would prove to be a valuable tool in studying creativity and other aspects of student achievement. The present research was viewed as a first study in a series designed to refine an instrument to be used in examining relationships among such variables as classroom environment, teacher personality, teaching style, creativity, and other facets of the teaching-learning process.

This study is related to the series of psychological environment, or environmental press, generated by the Syracuse Indexes. One of the first studies in this series was the development of a measure of the psychological environment of colleges (Pace and Stern, 1958). A questionnaire, the College Characteristics Index, had its origins in the earlier work by Stern, Stein, and Bloom (1956) who used Murray's (1938) concepts of <u>need</u> and <u>press</u> as a basis for the development of objective measures of these concepts. Murray used the term <u>press</u> for external pressures as perceived by the individual and the tern <u>need</u> for internal states. An individual's needs are inferred from the kinds of activities in which he engages; the press is inferred from the activities that he reports as going on around him. Stern's work is based on the idea that when there is a high consensus among individuals in a particular environment regarding the characteristics in the environment, a "real" environment can be described.

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2. The authors are deeply grateful to Joel Richman of Syracuse University for his valuable assistance in this project.

The College Characteristics Index consists of 30 scales of 10 items each, totalling 300 items. Every 30th item contributes to a particular scale. Each scale corresponds to a particular aspect of the environment. Scale 12, for example, measures Emotionality (intense, open emotional expression versus stolidness, restraint, control or constriction). The person being tested indicates his agreement or disagreement with such statements as "Students here learn that they are not only expected to develop ideas but also to express them in action," "Most students get extremely tense during exam periods," and "The way people feel around here is always pretty evident."

Five such Indexes were developed by Stern and his associates. The original prototype measured needs (Activities Index). The other four Indexes measured various types of institutional press (College Characteristics Index, Evening College Characteristics Index, High School Characteristics Index, and the more generalized Organizational Climate Index).

The Classroom Environment Index (CEI) uses the same structure as the other Syracuse Indexes. To the extent possible, the content of each item was kept similar to those of the other Indexes. Naturally, it was necessary to make a considerable number of revisions to make the instrument applicable to individual classrooms rather than to the total institution. The High School Characteristics Index was the Index most similar to the CEI, but items from other Indexes were examined for possible adaptations to the classroom setting. Murray's (1938) original variables were also re-examined for additional sources of CEI items.

Classrooms have been studies through the use of classroom observation instruments and through the use of descriptions of the environment. Examples of observational instruments are found in the work of Anderson (1939), Medley and Mitzel (1958), and Amidon and Flanders (1960). A comprehensive anthology of classroom observation instruments was presented by Simon and Boyer (1968).

Representative studies of classroom environments are those of Astin (1965), who has studied classroom environments at the college level using student perceptions of characteristics of the classroom environment, together with such items as size of class, age of instructor, hour class meets, etc. Deshpande, Webb, and Marks (1970) have used the Teacher Description Instrument (TDI) to study student perceptions of college instructor behavior and evaluation of instruction. Hall (1970) applied Pervin's concept of person-environment fit to learning in college classrooms, using a 35-item description of teacher style. Anderson (1970) employed the Learning Environment Inventory (LEI) to examine relationships of classroom social climate to individual learning.

The present study focuses on the classroom setting as do the studies described above, but employs the systematic and establisned structure of the Syracuse Indexes to accomplish this end. The expectations of this research were that the scales of the CEI would exhibit adequate homogeneity and reliability and that the CEI would discriminate among different classroom environments. A further expectation was that factors extracted from the CEI scales would be similar to those of other Syracuse Environment Indexes.

METHOD

Classroom Environment Index

The CEI was developed in an initial form, using the same structure as the other Syracuse Indexes (30 scales, 10 items each, for a total of 300 items). The content of each item was kept as similar as possible to those of the other environment Indexes but was revised to be applicable to the classroom. Three forms of the CEI were used in the present study. In the first two forms, 1069 and 570, each scale contained approximately five items that were the same in both forms and five additional items that were different, giving a total of approximately fifteen different items per scale for the two forms. The third form, 1170, was constructed using the best items of the first two forms and adding a few additional new items. In addition, Form 1170 was reviewed by researchers in Canada, Australia, and New Zealand in an attempt to eliminate problems in semantics and vocabulary that would interfere with the administration of the instrument in other English-speaking countries. To the extent possible, the suggestions of the foreign observers were incorporated into Form 1170.

One other change was made in Form 1170. In Forms 1069 and 570, every 30th item contributed to a particular scale. The Abasement scale, for example, consisted of items 1, 31, 61, 91, etc. Early difficulties in administering the instrument within a typical classroom time period had suggested that a shorter form would be more feasible. To achieve this end and still maintain the essential structure of the Index, Form 1170 was split into two sub-forms (1170-1 and 1170-151). Form 1170-1 included the first fifteen scales; 1170-151 included the scales 16 to 30. Every fifteenth item, instead of every 30th item, now contributed to a particular scale. For example, in the Abasement scale, items 1, 16, 31, etc. relate to abasement. It was now easily possible to administer one sub-form in the typical classroom period. By having half the class complete each sub-form, all scales could be obtained for a classroom. If time permitted, it was still possible to have all students complete both sub-forms, occasionally using two classroom periods instead of one, with students completing one sub-form in each of two periods.

Sample

Different samples were used for each of the three forms of the CEI. The first form, 1069, was administered to 553 students in 27 different classrooms. Most of the classrooms were from an enlarged village school district in Upstate New York, with a student population of approximately 2,500. In addition, several college classrooms were included from a small private nondenominational coeducational college in New York State. The second form, 570, was administered to 179 students in eight classrooms from two Upstate New York public school enlarged village districts of approximately 2,500 pupils each.

There were several differences in the way the first form was administered as compared with the second form. For most classrooms, the first form was administered by members of the research team; no classroom teachers were involved. In addition, the form was not administered in the regular classroom situation. For the most part this first form of the CEI was administered in large study halls and large instructional areas. Because of the many difficulties involved in these procedures, it was decided to make some changes in the second administration. Therefore, the second form was administered by the individual classroom teacher in his own classroom to his own students. This seemed to be a much better procedure and involved fewer difficulties.

The third form, 1170, was administered to students in over 40 classrooms. Only 31 classrooms were included in the analysis because of the small number of cases in several situations; all classrooms were eliminated where there were not at least ten cases of each of the subforms, for a total of 20 cases. In the 31 classrooms included in the analysis, 477 cases were available for Form 1170-1 and 462 cases were available for Form 1170-151. For the factor analysis of Form 1170, 448 cases were available.

A wider variety of classrooms and administrative procedures were used with Form 1170. In most instances, the regular classroom teacher administered the instrument or at least assisted in its administration. The classrooms were from a variety of schools, including a large Mid-Western city school district, a suburban New England school district, and classrooms from two large universities. The fact that Form 1170 could be completed within a typical classroom period greatly facilitated its administration. A more complete description of the samples, together with the coding format, can be found in Walker (1971).

RESULTS

The tests were scored by means of the Optical Scanning equipment at the Psychological Research Center at Syracuse University. Special answer sheets for the Environmental Indexes, designed for the 300 items, were employed. On the special answer sheet, an 11-digit code was used to identify the specific classroom, subject, school, grade, sex, and form of the CEI. In most cases, the special coding was done by the research team and not by the student. The student merely indicated subject, grade, and sex on the answer sheet. Until the coding was completed, it was necessary to keep each set of answer sheets for a particular classroom in a separate folder which identified the specific classroom and school.

For each of the three forms of the CEI, the data were analyzed to yield a discrimination index for each item, the reliability of each scale, the ability of each scale to differentiate among sexes, grades, subjects, and classrooms. For the third form of the CEI, 1170, additional data were available with regard to the ability of each scale to differentiate between levels (junior high, senior high, college) and with regard to the interaction of variables. First and second-order factors were extracted from the scale scores of CEI Form 1170.

Scale Definitions

A brief definition of each scale variable follows. Stern (1970) provides a more complete definition of each scale.

1. ABA Abasement--ASS Assurance: self-depreciation versus self confidence.
2. ACH Achievement: striving for success through personal effort.
3. ADA Adaptability--DFS Defensiveness: acceptance of criticism versus resistance to suggestion.
4. AFF Affiliation: group-centered social orientation.
5. AGG Aggression--BLA Blame Avoidance: hostility versus inhibition.
6. CHA Change--SAM Sameness: flexibility versus routine.
7. CNJ Conjunctivity--DSJ Disjunctivity: planfulness versus disorganization.
8. CTR Counteraction: restriving after failure.
9. DFR Deference--RST Restiveness: respect for authority versus rebelliousness.
10. DOM Dominance--TOL Tolerance: ascendancy versus forbearance.
11. E/A Ego Achievement: striving for power through social action.
12. EMO Emotionality--PLC Placidity: expressiveness versus stolidness.
13. ENY Energy--PAS Passivity: effort versus inertia.
14. EXH Exhibitionism--INF Inferiority Avoidance: attention-seeking versus shyness.
15. F/A Fantasied Achievement: daydreams of extraordinary public-recognition.
16. HAR Harm Avoidance--RSK Risktaking: fearfulness versus thrill-seeking.
17. HUM Humanities, Social Science: interests in the humanities and the social sciences.
18. IMP Impulsiveness--DEL Deliberation: impetuousness versus reflection.
19. NAR Narcissism: vanity.
20. NUR Nurturance: helping others.
21. OBJ Objectivity--PRO Projectivity: objective detachment versus suspicion.
22. ORD Order--DSO Disorder: compulsive organization of details versus carelessness.
23. PLY Play--WRK Work: pleasure seeking versus purposefulness.
24. PRA Practicalness--IPR Impracticalness: interest in practical activity versus indifference to tangible personal gain.
25. REF Reflectiveness: introspective contemplation.
26. SCI Science: interests in the natural sciences.
27. SEN Sensuality--PUR Puritanism: interest in sensory and aesthetic experiences versus austerity or self-denial.
28. SEX Sexuality--PRU Prudishness: heterosexual interests versus asceticism.
29. SUP Supplication--AUT Autonomy: dependence versus self-reliance.
30. UND Understanding: intellectuality.

Group Means and Standard Deviations

The means and standard deviations of each of the three forms are summarized in Table 1. The trend seemed to be that these values were somewhat lower than those of the other Syracuse Indexes, although not markedly so. Some of the low means are easily accounted for. Scale 26 (Science), for example, would be expected to be low in non-science classrooms, since it relates indirectly to science course content and teaching

TABLE 1. Means and Standard Deviations of Three Forms of the CEI.

Scale	Form 1069[1]		Form 570[2]		Form 1170[3]	
	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
1. ABA	2.80	2.02	4.09	2.54	2.52	2.10
2. ACH	5.36	1.74	5.66	1.72	5.96	2.28
3. ADA	3.39	1.65	6.10	1.88	4.70	1.89
4. AFF	4.99	1.97	5.80	2.07	6.92	1.96
5. AGG	2.89	2.01	3.78	2.02	3.48	2.16
6. CHA	4.86	1.74	5.51	1.66	5.68	1.84
7. CNJ	6.48	2.06	6.69	2.01	6.87	2.44
8. CTR	5.52	1.69	5.87	2.00	6.45	2.15
9. DFR	5.58	1.72	5.18	1.76	5.89	2.22
10. DOM	3.37	2.21	5.34	2.29	4.74	2.51
11. E/A	4.92	2.12	4.34	2.48	4.96	2.44
12. EMO	5.37	1.55	4.35	1.60	4.63	1.65
13. ENY	3.80	2.02	4.44	2.12	3.94	2.37
14. EXH	5.21	1.85	6.16	1.85	5.18	1.82
15. F/A	3.93	1.50	5.03	1.73	5.46	1.38
16. HAR	4.91	2.01	3.98	1.86	4.93	1.76
17. HUM	3.60	2.10	3.36	1.87	4.39	2.33
18. IMP	5.41	1.86	6.72	1.80	5.88	2.01
19. NAR	4.57	1.99	5.18	1.79	4.03	1.74
20. NUR	4.75	2.22	5.22	2.16	4.42	2.23
21. OBJ	7.43	2.26	7.16	2.44	7.94	2.05
22. ORD	4.31	1.81	4.91	1.78	4.21	2.17
23. PLY	4.16	1.86	6.23	1.75	5.37	2.44
24. PRA	5.16	2.10	5.35	1.74	5.36	2.49
25. REF	5.07	1.91	5.36	2.14	6.09	2.29
26. SCI	3.68	1.90	2.50	1.87	2.85	1.67
27. SEN	3.87	1.56	3.72	1.54	4.47	2.06
28. SEX	4.51	1.79	3.79	1.69	3.18	2.04
29. SUP	5.15	1.83	5.25	1.37	5.82	1.79
30. UND	5.39	1.88	6.11	1.84	6.20	2.20
Grand Mean	4.68	1.90	5.11	1.91	5.08	2.13

[1]Form 1069 is based on a sample of 553 cases drawn from 27 classrooms.

[2]Form 570 is based on a sample of 179 cases drawn from 8 classrooms.

[3]Form 1170 combines two sub-forms, 1170-1 (477 cases) and 1170-151 (462 cases) from a total of 31 classrooms.

procedures. Other scales with low means were 1 (Abasement) and 5 (Aggression). The analyses of variance reported below reveal a number of instances where there is a consistent progression of mean upwards (or downwards) as a function of grade. The scale with the consistently highest mean was scale 21 (Objectivity), being above 7.00 for each form. Another scale that tended to be somewhat high was 7 (Conjunctivity).

With regard to variance, it is noted that the lowest values were scale 12 (Emotionality) and scale 15 (Fantasied Achievement). For form 1170, the variances for these two scales were 2.72 and 1.92, respectively. These variances were consistently low for all three forms of the CEI and undoubtedly contributed to the lower reliability values of these scales.

In their early study Pace and Stern (1958) found that the median of the mean scores for their sample was approximately 5.5 on the College Characteristics Index. The median of their standard deviations was approximately 1.7. They reasoned that an institution exhibited a distinctive press where the mean score fell in the upper or lower one-fourth of the total distribution. In other words, mean scores of 6.6 or higher and mean scores of 4.4 or lower would be suggestive of a press. In the present study the median mean score of the ninety means for the three forms was 5.05. The median of the standard deviations was approximately 1.94. Thus, mean scores of 6.36 or higher and mean scores of 3.74 or lower would be suggestive of a distinctive press in any particular classroom.

Stern (1970) has stated that since the Index items were constructed in accordance with specifications derived from an entirely theoretical system, the response characteristics of these scales were of more than ordinary interest. "The effectiveness of the Indexes as measuring devices has implications going beyond their pragmatic utility. The properties of these scales constitute an implicit test of the theoretical model that was their source.

"If the items of a given scale prove to be statistically homogeneous, it would be evidence of the fact that they are measures of the same process. To the extent that the scales are reliable, we shall be able to conclude that each set is a dependable measure of that process. To the extent that the scales are reliable, we shall be able to conclude that each set is a dependable measure of that process. Once this has been established to our satisfaction, we can go on to the next question concerning the nature of this empirically established process and its relationship to the one postulated by theory (p. 22)."

Scale Homogeneity

The contribution of each item to the total scale score provided an estimate of the internal consistency of each scale. Ebel's (1954) procedure for comparing the effectiveness of each item in discriminating between the extreme high and low scoring subject was employed. The formula is as follows:

$$\text{Item Discrimination Index} = \frac{R_u}{N_u} - \frac{R_l}{N_l}$$

R = number of correct responses

N = number of cases

u = cases for the upper 27% of the total distribution of scale scores

l = cases for the lower 27% of the total distribution of scale scores

Stern (1970) believes that the level of acceptability for the discrimination index should be raised from +.20 to +.30 to allow for the small number of items in each scale.

Using the above formula, the discrimination index for each of the 300 items in each form was calculated. In addition, the average discrimination index for each scale was computed. Table 2 summarizes the average item discrimination index (DI) for each scale for each of the three forms. The grand means for Forms 1069 and 570 were somewhat lower than the DI for other Syracuse Indexes (Stern, 1970). However, the DI's were sufficiently high to indicate a considerable amount of consistency of the items with their respective scales. The DI's for Form 1170 were higher and compared favorably with other Syracuse Indexes. For Form 1170, 91 percent of the items had DI's above .30. Less than 4 percent were below .20. Only one item was negative.

Scale Reliability

The scale reliabilities for the CEI were established using Kuder-Richardson Formula 20, which has been widely used with the other Syracuse Indexes. The formula is as follows:

$$KR_{20} = \frac{n}{n-1} \times \frac{\sigma_t^2 - \sum \overline{pq}}{\sigma_t^2}$$

n = the number of items

σ_t^2 = the score variance of the total scale

p = the proportion of correct answers to an individual item

q = the proportion of incorrect answers (1 - p) to an individual item

pq = the variance of the individual item

$\sum \overline{pq}$ = the average within-class sum of the item variances

Using stringent conditions, Stern found that the practical maximum for KR_{20} on a 10-item scale was between .83 and .91.

TABLE 2. Average Item Discrimination Indexes and Reliabilities of Three Forms of the CEI.

Scale	Form 1069[1]		Form 570[2]		Form 1170[3]	
	ID	KR_{20}	ID	KR_{20}	ID	KR_{20}
1. ABA	50[4]	66	63	79	52	76
2. ACH	43	43	42	50	57	72
3. ADA	40	45	46	52	47	55
4. AFF	49	60	51	64	48	63
5. AGG	50	64	49	59	53	72
6. CHA	41	47	40	35	45	50
7. CNJ	50	61	50	61	60	80
8. CTR	43	34	49	54	53	69
9. DFR	42	41	43	42	55	72
10. DOM	54	67	56	68	63	77
11. E/A	53	60	62	76	61	74
12. EMO	39	19	39	22	41	32
13. ENY	49	63	51	61	58	75
14. EXH	45	50	45	51	45	53
15. F/A	35	15	42	32	34	17
16. HAR	42	65	45	54	42	54
17. HUM	51	66	46	53	57	75
18. IMP	46	45	42	49	50	61
19. NAR	49	61	43	38	42	48
20. NUR	54	70	53	66	55	72
21. OBJ	53	76	59	80	49	77
22. ORD	44	50	43	48	54	69
23. PLY	45	55	42	52	61	80
24. PRA	51	60	43	34	62	76
25. REF	46	55	52	60	58	74
26. SCI	46	63	45	63	39	51
27. SEN	37	43	37	36	50	68
28. SEX	43	53	41	46	50	66
29. SUP	45	50	33	16	43	54
30. UND	46	54	45	52	54	71
Grand Mean	46	55	47	54	51	66

[1]Form 1069 is based on a sample of 553 cases drawn from 27 classrooms.

[2]Form 570 is based on a sample of 179 cases drawn from 8 classrooms.

[3]Form 1170 combines two sub-forms, 1170-1 (477 cases) and 1170-151 (462 cases) from a total of 31 classrooms.

[4]All entries in this table should be preceded by a decimal point.

The scale reliabilities are summarized in Table 2. For Forms 1069 and 570 the grand means were .55 and .54 respectively. These reliabilities were more than .10 lower than those obtained for other Syracuse Indexes. For Form 1170, however, the reliabilities were considerably higher and compared favorably with the other Syracuse Indexes. Form 1170 was distinctly improved in a number of ways. Since it was constructed from the best items of Forms 1069 and 570, its basic structure was strengthened. Improvements in the administration of Form 1170 undoubtedly enhanced its reliability. In addition, the sample was larger and included a wider variety of classrooms.

Two scales, 12 (Emotionality) and 15 (Fantasied Achievement) were particularly low. It is difficult to explain this, although it is noted that on several of the other Syracuse Indexes these two particular scales were also somewhat low. It should be noted that despite this lower reliability, both scales discriminated at .05 levels or better between sexes, subjects, grades, classrooms, and levels on CEI Form 1170.

Although the need exists to examine further the reliability of subsequent administrations of the CEI, it would appear reasonable to conclude that the reliabilities of most scales have reached adequate levels.

Differentiation

Simple one-way analysis of variance between scale means for sex, grade, school level, subject, and classroom was employed to examine the abilities of the scales to differentiate with respect to these variables. The major concern was whether or not the CEI would differentiate among classrooms. Its ability to distinctly indicate differences with regard to sex, grade, school level, and subject matter was also of considerable interest. Homogeneity of variance was examined by means of Bartlett's test. Two- and three-way analyses of variance were employed with the third form, 1170, to examine possible interactions among variables. The ability of the scales to differentiate between school levels was only examined with regard to Form 1170. The school levels were: junior high, senior high (grades 9 - 12), and college.

Tables 3, 4, and 5 summarize the results of the one-way analysis of variance. Also summarized in these tables are the results of Bartlett's test for homogeneity of variance. The probabilities for the F values and L values (Bartlett's Test) are presented. A summary of the F ratios (Walker 1971) indicates that most scales differentiated between grade, subject, and classrooms at high levels of significance.

The results tended to confirm expectations. It is noted that fewer scales differentiated between sex than between other variables. In general, the CEI exhibited considerable ability to differentiate between grades, subjects, classrooms, and levels. For Form 1069, for example, the differences were significant for 29 out of 30 scales with regard to grade and subject, and for all 30 scales with regard to classroom.

TABLE 3. One-Way Analysis of Variance Between Sexes, Grades, Subjects, and Classrooms for CEI Form 1069.

Scale	Source of Variation							
	Sex		Grade		Subject		Classroom	
	F	L	F	L	F	L	F	L
1. ABA	.001		.001	.001	.001	.001	.001	.001
2. ACH			.001		.001		.001	
3. ADA	.01		.001		.001		.001	.05
4. AFF			.001		.001	.05	.001	.01
5. AGG	.001	.01	.001	.05	.001		.001	.05
6. CHA			.001	.05	.001		.001	
7. CNJ	.001		.001	.05	.001		.001	.01
8. CTR	.01		.01	.01	.001		.001	.05
9. DFR			.001		.001	.01	.001	
10. DOM	.01		.001		.001	.05	.001	
11. E/A			.01		.001	.05	.001	
12. EMO			.001		.001		.001	
13. ENY			.001	.01	.001		.001	
14. EXH			.001		.001		.001	
15. F/A				.05	.001		.01	
16. HAR			.001	.05	.001	.001	.001	.05
17. HUM			.001	.01	.001	.01	.001	
18. IMP			.001		.001	.05	.001	
19. NAR			.001		.001	.05	.001	
20. NUR			.001		.001		.001	
21. OBJ	.001		.001	.001	.001	.001	.001	.001
22. ORD			.001			.05	.001	
23. PLY			.001		.001	.01	.001	
24. PRA			.01		.001		.001	
25. REF			.001	.05	.001		.001	.05
26. SCI	.05		.001	.001	.001		.001	
27. SEN			.001	.001	.001	.01	.001	.01
28. SEX			.001		.001		.001	.05
29. SUP			.001		.001	.001	.001	
30. UND			.001		.001		.001	

TABLE 4. One-Way Analysis of Variance Between Sexes, Grades, Subjects, and Classrooms for CEI Form 570.

Scale	Source of Variation							
	Sex		Grade		Subject		Classroom	
	F	L	F	L	F	L	F	L
1. ABA	.05		.001	.01	.001	.01	.001	.001
2. ACH			.001		.05		.001	
3. ADA	.05		.001		.001		.001	
4. AFF	.01		.05	.05	.001	.01	.001	
5. AGG			.001		.001		.001	
6. CHA			.001		.05		.01	
7. CNJ	.01		.05	.05	.05		.01	.05
8. CTR	.05		.001		.001		.001	
9. DFR			.001		.01		.001	
10. DOM			.001		.01		.001	
11. E/A			.001		.001		.001	
12. EMO			.01				.01	
13. ENY								
14. EXH			.001	.01			.001	
15. F/A								
16. HAR			.001		.001		.001	
17. HUM			.001				.001	
18. IMP			.01				.001	
19. NAR			.001				.001	
20. NUR	.01		.001		.001		.001	
21. OBJ	.05		.001		.001		.001	.01
22. ORD			.001				.001	
23. PLY					.05	.05	.001	.05
24. PRA			.001		.001		.001	
25. REF			.01			.05	.05	
26. SCI			.001				.001	
27. SEN		.05	.001		.01		.001	
28. SEX			.01				.01	
29. SUP					.05			
30. UND			.001		.001		.001	

TABLE 5. One-Way Analysis of Variance Between Sexes, Grades, Subjects, Classrooms, and Levels for CEI Form 1170.

Scale	Sex		Grade		Subject		Classroom		Level	
	F	L	F	L	F	L	F	L	F	L
1. ABA			.001	.001	.001	.001	.001	.001	.001	.001
2. ACH	.05	.05	.01		.001	.001	.001	.05		
3. ADA			.001		.001		.001		.001	
4. AFF	.01		.001		.01		.001			
5. AGG			?[1]	?[1]	.001	.001	.001		.001	.001
6. CHA			.001		.001		.001			
7. CNJ			.001	.001	.001	.001	.001	.001	.001	.01
8. CTR			?[1]	?[1]	.001		.001		.001	.01
9. DFR			.001	.01	.001	.001	.001	.01	.001	.001
10. DOM			.001	.001	.001	.05	.001	.01	.001	.001
11. E/A			.001		.001		.001			
12. EMO	.05		.001		.001	.05	.001		.001	
13. ENY			.01		.001	.05	.001		.001	.05
14. EXH	.001		.001	.05	.001	.01	.001		.001	
15. F/A	.01		.05		.05		.001		.01	
16. HAR	.01		.001				.001			
17. HUM		.05	.001	.05	.001	.01	.001			
18. IMP	.01		.001		.001		.001		.001	.05
19. NAR	.05		.001		.001		.001		.001	
20. NUR			.001		.05		.001	.01		
21. OBJ	.001	.01	.001	.001	.001	.001	.001	.001	.001	.001
22. ORD			.001		.001	.05	.001		.01	.01
23. PLY		.01	.001	.05	.001	.05	.001		.001	.001
24. PRA			.001	.05	.001	.05	.001		.001	
25. REF			.001		.001	.05	.001		.001	
26. SCI			.05		.01		.001			
27. SEN	.05		?[1]	?[1]	.001	.001	.001		.001	.001
28. SEX	.05		?[1]	?[1]	.001	.001	.001		.001	.05
29. SUP	.05		.001				.001	.01		
30. UND		.05	.001		.001		.001		.001	

[1]Data not available.

The fact that there were fewer grade levels represented and only three different subject areas for Form 570 would seem to account for the fewer number of significant differences. With regard to grade level, differences were significant for 26 of 30 variables; with regard to subject area, differences were significant in 19 out of 30 variables.

The pattern for CEI Form 1170 was similar to that of the two previous forms. It is noted, however, that there were more significant differences with regard to sex. With regard to level, there were significant F ratios for 21 of the 30 scales.

Interaction of Variables

In addition to examining the ability of the scales to differentiate among such variables as sex, grade, subject, classroom and level, we are also concerned with the interaction of variables. Table 6 summarizes the results of two- and three-way analyses of variance for a number of combinations of variables. The statistically significant interactions are presented. For example, with regard to the interaction of sex and subject, it is noted that there was only one statistically significant interaction--having to do with scale 10 (Dominance). With regard to sex and grade there were six significant interactions. In examining all the possible significant interactions, it is noted that out of a potential 180 combinations, only 24 were statistically significant. Since there seemed to be no consistent interactions, it would seem reasonable to conclude that there is no significant confounding of variables.

Item Consensus

In addition to item homogeneity, it would seem reasonable to expect that each item would be answered in the same way by most students using a given classroom as a reference. High consensus on items is important. It would seem desirable to expect class members to answer items in a common way, say, 70 percent of the time.

In examining item consensus, it was observed that consensus differed from classroom to classroom. Certain items achieved high consensus in some classrooms, whereas identical items achieved low consensus in others. A number of reasons might account for this, such as how well the students personally knew the teacher, how long the class had been meeting, or the amount of evidence that was available to the student to make a judgement.

Table 7 is a summary of the responses to each item by students in one of the investigator's own classes. Since there were only eleven students in the course, the investigator had the opportunity to become well acquainted with each student. In addition, he was thoroughly familiar with the content of the course, the general classroom procedures, and other matters relating to the classroom climate.

Table 6. Two- and Three-Way Analyses of Variance Between Selected Variables for CEI Form 1170.

Scale	Source: Sex X Subject	Sex X Grade	Sex X Classroom	Sex X Level	Subject X Grade	Sex X Subject X Grade
1. ABA						
2. ACH		.05	.05			.01
3. ADA		.05				.001
4. AFF						
5. AGG					.01	.001
6. CHA						
7. CNJ						
8. CTR		.05				
9. DFR			.05			
10. DOM	.01					.001
11. E/A		.01				
12. EMO						
13. ENY						
14. EXH						
15. F/A						
16. HAR						
17. HUM			.01		.01	
18. IMP						
19. NAR			.05			
20. NUR		.01			.05	
21. OBJ						
22. ORD						
23. PLY					.001	
24. PRA					.05	
25. REF						.001
26. SCI						
27. SEN					.05	
28. SEX			.05			
29. SUP						
30. UND		.05			.01	

TABLE 7. Item Consensus for a Graduate Education Classroom Using CEI Form 1069 with 11 Cases. Percentage of Agreement as Keyed.

Scale	Scale Items									
	1	2	3	4	5	6	7	8	9	10
1. ABA	9	0	9	0	0	0	0	0	0	0
2. ACH	27	45	27	64	91	36	100	18	45	18
3. ADA	73	27	100	0	64	0	9	0	0	0
4. AFF	73	82	64	100	91	91	91	82	9	9
5. AGG	27	18	0	27	0	9	36	0	9	9
6. CHA	73	73	100	45	91	9	0	91	100	27
7. CNJ	91	82	73	82	100	82	82	36	100	100
8. CTR	91	82	73	100	91	100	9	64	91	18
9. DFR	9	82	27	18	82	45	100	27	82	9
10. DOM	36	0	18	18	0	0	18	18	9	0
11. E/A	91	82	73	55	45	73	27	82	100	73
12. EMO	73	9	82	82	55	64	27	27	55	73
13. ENY	82	64	18	27	100	27	91	100	36	18
14. EXH	55	64	55	64	9	73	9	18	100	55
15. F/A	82	64	55	91	0	64	55	27	18	73
16. HAR	9	100	0	9	0	18	73	27	64	64
17. HUM	36	0	82	91	91	0	55	91	9	100
18. IMP	91	18	64	27	64	82	82	9	45	45
19. NAR	91	55	9	0	9	45	0	27	91	18
20. NUR	64	55	9	0	0	82	0	82	73	91
21. OBJ	91	82	100	100	91	100	91	100	100	100
22. ORD	100	0	0	18	36	91	45	82	9	100
23. PLY	36	9	9	9	73	64	91	100	27	0
24. PRA	82	91	91	0	100	45	91	82	45	82
25. REF	73	0	91	82	91	100	91	100	91	18
26. SCI	9	55	100	0	82	0	9	45	0	55
27. SEN	36	18	9	0	0	100	0	0	100	9
28. SEX	18	91	73	82	18	9	9	27	91	82
29. SUP	91	100	91	18	9	64	82	100	0	73
30. UND	36	100	91	45	100	100	91	82	45	100

By examining the responses to each item, the investigator was able to discover a number of problems students had in answering items where consensus was low. It should be noted that for many items consensus was extremely high. For example, on scale 1 (Abasement) there was 100 percent agreement on eight items and 91 percent agreement on the other two items. The conclusion to be drawn was that there was almost unanimous agreement that Abasement press was extremely low. On other scales, 14 (Exhibitionism), for example, consensus was low on several of the items. On only five of the 10 items in scale 14 was consensus above 70 percent. (Percentage scales above 70 and below 30 on Table 7 indicate consensus above 70 percent.)

It is interesting to examine individual items to help account for problems in consensus. The first five items on scale 1 (Abasement) for Form 1069 are as follows:

1. The teacher is very interested in student ideas or opinions about classroom affairs. (Keyed false.)
2. You need permission to do anything in this classroom. (Keyed true.)
3. Students are seldom kept waiting when they ask the teacher for help. (Keyed false.)
4. The teacher very often makes you feel like a child. (Keyed true.)
5. Students are made to take the blame for things whether they did them or not. (Keyed true.)

It can be seen from Table 7 that there is very high consensus among the students on these five items. Only one student scored the correct response on item 1 and one student scored the correct response on item 3. In other words, of the 55 responses (11 per item) 53 of the responses were in the direction of Assurance as opposed to Abasement.

On scale 14 (Exhibitionism), on the other hand, the consensus was not nearly so pronounced. The first five items of scale 14 (Exhibitionism) are as follows:

1. Students in this class like to dress colorfully. (Keyed true.)
2. When a student does a project or wins a prize, everybody hears about it. (Keyed true.)
3. The teacher provides opportunities for students to develop their skills and talents directing the work of others. (Keyed true.)
4. Most students here tend to be shy in groups. (Keyed false.)
5. Students in this class like to draw attention to themselves. (Keyed true.)

With the exception of item 5 on scale 14 (Exhibitionism), the consensus of the items tended to be mixed. The resulting press for Exhibitionism would tend not to be very pronounced.

Item 1 has to do with whether or not students in the class like to dress colorfully. Fifty-five percent of the students agreed with this item; 45 percent disagreed. In the investigator's opinion, the students did dress rather colorfully, but not more so than the average young graduate student. The students in this particular course were all first-year graduate students, approximately 22 years old. Their perceptions of colorful dress are probably somewhat different than the investigator's, since students do, in fact, dress more colorfully today than they did, say, ten years ago. Probably whether or not a student agreed with this item depended upon what his perception of what colorful dress actually was.

Sixty-four percent of the class agreed that when a student does a project or wins a prize, everybody hears about it. Since the students in this particular class knew each other rather well, they probably would tend to know what projects each was involved in and would probably hear about it if one of them won a prize. However, the relationship of the students probably was not as close as it would be for a typical secondary school classroom.

One can continue to speculate about the reasons for the low consensus on this scale, but it would be difficult to pinpoint precise causes without further investigation, such as, possibly, discussing the individual items with students and asking the students why they responded in the way they did to that particular item.

The first two items in scale 22 (order) offer an interesting contrast and yet are consistent with the actual situation. The first item is, "Most students seldom change places in this classroom." (Keyed true.) This was true. After the first or second class meeting, students tended almost always to take the same seat. The second item, "The teacher gets very upset if students happen to report to class a little late," (Keyed true.) also had 100 percent agreement. In other words, the teacher took little notice of students who arrived late. In examining the other responses to scale 22, it can be seen that there was a trend away from a press toward Order, although the trend was not distinct.

By investigating many individual items, the investigator was able to get a rough validation for many of the items as they related to this particular classroom. There were a number of items where there was no question as to what the response had to be, for example, items dealing with the physical appearance of the classroom, such as having pictures on the wall. For other items, it was easy to see why responses were mixed, since the students really had little or no evidence upon which to base a response. Table 7, indicates that consensus was below 70 percent for approximately 17 percent of the items for that particular classroom.

Factor Structure

The third form of the CEI, 1170, was factored (principal components and normal equamax), based on 448 cases. Table 8 lists the loadings of the rotation. The analysis yielded six factors, accounting for 57.4 percent of the variance. The six factors were intercorrelated and refactored (Tables 9 and 10). The matrix suggested two unrelated clusters which proved to be two interpretable factors accounting for 62.8 of the common variance. The second-order factors have been plotted in Figure 1.

TABLE 8. CEI 1170 Rotated Factors (Equamax)

Scale	1. Humanistic Intellectual Climate	2. Group Intellectual Life	3. Achievement Standards	4. Personal Dignity	5. Orderliness	6. Science	h^2
1. ABA	-18	-23	11	-74	-08	16	68
2. ACH	05	03	71	05	21	-06	56
3. ADA	-02	10	60	-17	-10	11	42
4. AFF	19	07	35	56	-30	03	57
5. AGG	02	-18	04	-77	-21	10	68
6. CHA	54	16	30	12	-21	-03	47
7. CNJ	05	00	51	36	40	-03	56
8. CTR	25	23	40	57	-02	-02	60
9. DFR	06	24	39	66	03	-04	65
10. DOM	-09	-17	02	-76	-09	03	62
11. E/A	52	.08	17	22	-17	31	48
12. EMO	34	02	45	-37	-26	10	54
13. ENY	28	13	64	26	03	02	57
14. EXH	00	-11	09	-40	-54	02	47
15. F/A	70	-12	02	-16	-01	03	53
16. HAR	-13	67	08	04	01	06	47
17. HUM	52	37	-10	10	-25	37	62
18. IMP	10	-05	00	-16	-71	19	57
19. NAR	-31	01	33	-29	02	43	47
20. NUR	16	63	21	05	-16	40	66
21. OBJ	17	60	-11	41	-06	-26	63
22. ORD	-13	03	34	-13	65	19	61
23. PLY	15	33	05	10	-65	30	66
24. PRA	14	59	23	13	36	08	57
25. REF	53	57	-03	26	10	11	69
26. SCI	13	07	-06	-06	10	73	58
27. SEN	26	34	00	05	-47	37	55
28. SEX	04	-21	-04	-05	-39	59	55
29. SUP	13	65	11	21	-23	-10	55
30. UND	43	59	18	22	09	12	64
Σc^2	2.47	3.38	2.72	3.91	2.80	1.94	17.22

TABLE 9. Correlation Matrix for First-Order CEI 1170 Factors

CEI Factor	1	2	3	4	5	6
1. Humanistic Intellectual Climate[1]	—	.63	.27	.39	-.36	.13
2. Group Intellectual Life		—	.30	.54	-.15	-.03
3. Achievement Standards			—	.31	.09	.06
4. Personal Dignity				—	.04	-.25
5. Orderliness					—	-.30
6. Science						—

TABLE 10. Second-Order Rotated CEI 1170 Factors

	I. Development Press	II. Control Press
1. Humanistic Intellectual Climate[1]	.75	-.44
2. Group Intellectual Life	.85	-.14
3. Achievement Standards	.56	.09
4. Personal Dignity	.79	.27
5. Orderliness	-.11	.80
6. Science	-.14	-.75

1. Scale 30 was inadvertently omitted from Factor 1 in these computations. This will have a slight but demonstrable effect on the correlation matrix and on the second-order rotation. These values are now being recomputed; the authors should be consulted for corrected values.

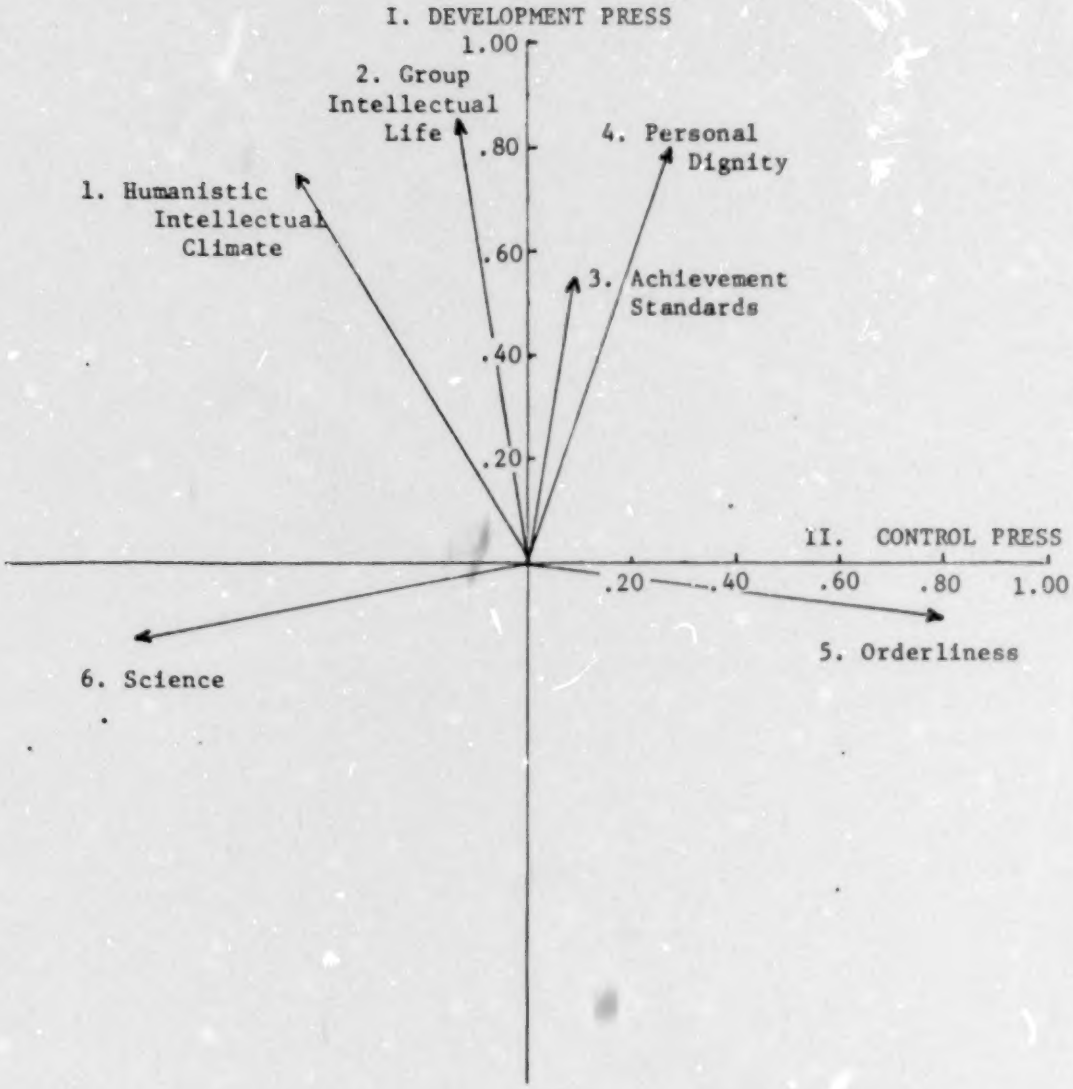

Fig. 1. The projection of CEI first-order factors in second-order space.

Interpretation of the six first-order factors in relationship to the second-order structure follows.

I. DEVELOPMENT PRESS

The first four factors consist of those characteristics of the environment that are related to intellectual and interpersonal activities. They are similar to factors previously extracted from the College Characteristics Index and the High School Characteristics.

1. Humanistic Intellectual Climate. This factor has much in common with the Intellectual Climate factors of other Indexes. It includes aspects of achievement together with elements of contemplation and social concern. The scales defining it are as follows:

Scale	Factor Loading
Fantasied Achievement (15)	.70
Change (6)	.54
Reflectiveness (25)	.53
Ego Achievement (11)	.52
Humanities, Social Science (17)	.52
[Understanding (30)	.43][1]

2. Group Intellectual Life. Similar to the Group Life factors of other Indexes, this factor includes an intellectual dimension as well. It includes aspects of intellectuality, reflectiveness, objective thinking, and practicality. It lies closer to the development axis than does Humanistic Intellectual Climate.

Scale	Factor Loading
Harm Avoidance (16)	.67
Supplication (29)	.65
Nurturance (20)	.63
Objectivity (21)	.60
Understanding (30)	.59
Practicalness (24)	.59
Reflectiveness (25)	.57

3. Achievement Standards. This is a measure of striving for success, accompanied by high levels of activity and effort. Activity is well coordinated. A degree of intense emotional expression is in evidence.

Scale	Factor Loading
Achievement (2)	.71
Energy (13)	.64
Adaptability (3)	.60
Conjunctivity (7)	.51
Emotionality (12)	.45

1. See note on p. 20.

4. Personal Dignity. This factor indicates individual responsibility and personal autonomy. It is characterized by tolerance, self-confidence, and friendliness.

Scale	Factor Loading
Aggression (5)	-.77
Dominance (10)	-.76
Abasement (1)	-.74
Deference (9)	.66
Counteraction (8)	.57
Affiliation (4)	.56

II. CONTROL PRESS

The Control factors describe the degree to which there is emphasis upon orderliness, bureaucratic administrative procedures, and cautiousness. Self-aggrandizement is de-emphasized. The high Control press is associated with the absence of a press for science. That the absence of Control is associated with Science is shown in Figure 1.

5. Orderliness. Classrooms scoring high on this factor would be characterized by caution, seriousness, orderliness, and austerity. This factor lies close to the control axis. It is defined by the following scales.

Scale	Factor Loading
Impulsiveness (18)	-.71
Play (23)	-.65
Order (22)	.65
Exhibitionism (14)	-.54
Sensuality (27)	-.47

6. Non-Science. The second factor contributing to the Control press involves the absence of an interest in the natural sciences, together with a lack of aspects associated with sexuality and egotism.

Scale	Factor Loading
Science (26)	-.73
Sexuality (28)	-.59
Narcissism (19)	-.43

DISCUSSION

In general, the expectations of the study were realized. The third form of the Classroom Environment Index, which was constructed from the best items of two previous forms, exhibited adequate homogeneity and reliability, differentiated among classrooms, and yielded a factor structure not unlike that of other Syracuse Indexes. The most recent

revision of the CEI, which replaced a few unsatisfactory items of the third form with superior items from previous forms, appears as Appendix A.

The following recommendations are presented with regard to further use and development of the CEI:

1. It seems to be best if the CEI can be administered in the regular classroom situation by the regular classroom teacher. Administering the instrument in non-classroom situations, such as study halls and large instructional areas, proved to be less satisfactory.

2. It is difficult to administer the instrument to large groups. Where there are more than approximately 30 students, assistance is usually needed.

3. It is desirable to assure teachers and students of anonymity. Since many of the items relate directly to the teacher, questionable results might be obtained in situations where either the students or the teacher felt that the information would not be treated confidentially. In one testing situation, the students became very upset when they thought the items might reflect adversely upon their teacher. It took a considerable amount of reassurance on the part of the teacher to convince them that their responses were not being used to judge the teacher.

4. Where possible, students should complete all 300 items. Where this is not feasible because of time limitations, the class can be divided into two halves, with one half completing Part 1 and the second half completing Part 2.

5. Time becomes a problem, especially at lower grade levels. The average college student can easily complete all 300 items within the typical 50-minute classroom period. Upper ability level secondary students can usually complete the entire instrument within a typical secondary school period. The average secondary school student, however, in the typical classroom period, has difficulty, but can manage one of the sub-forms. This means that if one desires all 300 items from the typical secondary student, more than one classroom period would be needed.

6. Some students can be expected to have difficulty reading some of the test items, especially at the lower grade levels. An average group of fifth graders had a considerable amount of difficulty with vocabulary. If the CEI is used with students who have trouble reading it, special assistance might be required to help them understand individual items. Additional time would also be required to complete the instrument. The present study would suggest that the CEI can be effectively used with average students as low as grade 7. Below grade 7, the average student seems to encounter difficulty in interpreting test items, although above-average upper elementary grade pupils seem to be able to complete the instrument without difficulty. A possible future study might be to determine the reading level of the CEI, using some established formula.

7. Even in its experimental form, the instrument has value for the classroom teacher who wishes to examine and analyze his own teaching. Normative data are beginning to become available and it is possible for a teacher to compare the profile of his own class with that of existing classrooms. It is noted from Tables 3 through 5 that the mean score for the scale Order ranges from 4.21 to 4.91. If a teacher should find his score considerably above or below this mean, he could raise a number of questions regarding the implications of this divergence.

8. It was concluded in the present study that it is preferable not to have the student do the coding on the answer sheet. In addition to being time-consuming, there were many errors when students did the coding.

Further Development

The intent of this study was to develop an input out of which factor parameters could be obtained. This smaller number of factors would be considerably more wieldy and less redundant and complex than working with the 30 scales.

The intent was to develop an instrument that would be useful across grade levels so that comparisons could be made--so that classes in different subject areas and at different educational levels could be compared with each other. As further data become available, important systematic differences between classrooms, subject areas, and levels are expected to emerge. The factors will make it possible not only to analyze the unique qualities of any given classroom, but also to establish developing qualities. Having an instrument that is available at all levels means that one can not only establish sequential development, but can see where a given classroom fits into the general picture.

It would be of considerable interest to be able to discuss the evolution of development of particular parameters as one moves from junior high school to senior high school to college. With a factor such as Humanistic Intellectual Climate, it would be of considerable interest to see whether such a factor showed an increase as one moved upward through the educational levels, regardless of the school or class type. If this proved to be the case, then one would be able to look at an individual classroom that was not consistent with the general trend and raise questions regarding this lack of consistency.

Additional research is being planned which would examine the factor structure with larger samples and would establish the reliability and homogeneity of the factors. Long range plans include studies of relationships of classroom environments with such variables as creativity, teacher personality, and student achievement.

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